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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/817,591	03/26/2001	Yihong Gong	CA1122	7751

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EXAMINER	
TRAN, QUOC A	
ART UNIT	PAPER NUMBER
2176	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	09/817,591	GONG ET AL.	
	Examiner	Art Unit	
	Tran A. Quoc	2176	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 December 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *02/12/02; 07/26/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This is a **Non-Final** Rejection in response to the RCE filed on 12-29-2006, and Amendments filed 11-01-2006.

2. Claims 1-32 are pending and rejected in this action.

3. Effective filing date 03/26/2001, which claims benefit of 60/254,535 filed 12/12/2000.

Continued Examination Under 37 CFR 1.114

4. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11-01-2006 has been entered.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> ***(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.***

Claims 1-32 are rejected under 35 U.S.C. 103(a) as being unpatentable by Billheimer et al. US Patent No. 6,611,825 B1 - filed 06/09/1999 (hereinafter Billheimer), in view of Goldstein et al. " Summarizing Text Documents: Sentence Selection and Evaluation Metrics" published 08/1999 by ACM Press (hereinafter Goldstein), further in view of Goldstein et al. "Multi-Document Summarization By Sentence Extraction" published 04/2000 by ACM Press (hereinafter Goldstein's Sentence Extraction).

Regarding **independent claim 1**, Billheimer teaches:

> **A method of creating a generic text summary of a document; said method comprising: creating a weighted document term-frequency vector for said document;**

(See, Billheimer at col. 4, line 35 through col. 6, line 40, discloses summarization of individual documents and groups of documents, and document cross-referencing using a term frequency matrix of the term frequencies for each of the documents. Using the broadest reasonable interpretation, the Examiner reads the claimed **a weighted document term-frequency vector** as

equivalent to a term frequency matrix of the term frequencies for each of the documents as taught by Billheimer.

In addition, Billheimer does not explicitly teach, but Goldstein teaches:

for each sentence in said document, creating a weighted sentence term-frequency vector; computing a score for each said weighted sentence term-frequency vector in accordance with relevance to said weighted document

(See, Goldstein at pages 121-122, discloses the method of generating summaries by text extraction, wherein sentence is scored using a centroid query vector.

Also, see Goldstein at pages 121-122, discloses the method of generating summaries by text extraction, wherein each sentence is scored according to the following formula and then ordered in a summary according to rank order,

$$Score(S_i) = \lambda \sum_{s \in S} w_s * (Q_s \cdot S_i) + (1 - \lambda) * \sum_{l \in L} w_l * (L_l \cdot S_i)$$

where S is the set of statistical features, L is the set of linguistic features, Q is the query, and w is the weights for the features in that set. These weights can be tuned according to the type of data set used and the type of summary desired.

In addition, Goldstein teaches:

selecting a sentence for inclusion in said generic text summary in accordance with said computing;

Also, see Goldstein at pages 121-122, discloses the method of generating summaries by text extraction, wherein each sentence is scored according to the following formula and then ordered in a summary according to rank order.

$$Score(S_i) = \lambda \sum_{s \in S} w_s * (Q_s \cdot S_i) + (1 - \lambda) * \sum_{l \in L} w_l * (L_l \cdot S_i)$$

where S is the set of statistical features, L is the set of linguistic features, Q is the query, and w is the weights for the features in that set. These weights can be tuned according to the type of data set used and the type of summary desired. The evaluators also marked each document as relevant or not relevant to the topic and selected the three most relevant sentences for each article from the sentences that they had marked relevant (yielding a most relevant sentence data set of 1-9 sentences per document). This set has an average of 5.6 sentences per document and 58.2% of the relevant sentence summaries contain the first sentence.)

In addition, Billheimer and Goldstein do not explicitly teach, but Goldstein's Sentence Extraction teaches:

> **deleting said sentence from said document and eliminating terms in said sentence from said document.**

(See, Goldstein's Sentence Extraction at page 40 Title, discloses multi-document summarization by sentence extraction.

Also, see Goldstein's Sentence Extraction fig. 1 –3, and at pages 44 right-col bottom through page 45 left-col bottom, discloses multi-document summarization by sentence extraction. For example, Figure 2 depict sentences from (#1- #10 with rank order), wherein sentences #2, #4, #6, and #9, which constitutes 70% of the sentences in the summary. Furthermore, sentence #3 is an exact duplicate of sentence #2, and sentence #7 is almost identical to sentence #4. Finally, the new summary retained only three of the sentences from the earlier summary. Using the broadest reasonable interpretation, the Examiner equates the claimed

deleting said sentence from said document as equivalent to document summarization by sentence extraction as taught by Goldstein's Sentence Extraction.

$$MMR\text{-}MD \stackrel{def}{=} Arg \max_{P_{ij} \in R \setminus S} \left[\lambda(Sim_1(P_{ij}, Q, C_{ij}, D_i, D)) - (1-\lambda) \max_{P_{nm} \in S} Sim_2(P_{ij}, P_{nm}, C, S, D_i)) \right]$$

$$Sim_1(P_{ij}, Q, C_{ij}, D_i, D) = w_1 * (P_{ij} \cdot Q) + w_2 * coverage(P_{ij}, C_{ij}) + w_3 * content(P_{ij}) + w_4 * time\_sequence(D_i, D)$$

$$Sim_2(P_{ij}, P_{nm}, C, S, D_i) = w_a * (P_{ij} \cdot P_{nm}) + w_b * clusters\_selected(C_{ij}, S) + w_c * documents\_selected(D_i, S)$$

$$coverage(P_{ij}, C) = \sum_{k \in C_{ij}} w_k * |k|$$

$$content(P_{ij}) = \sum_{W \in P_{ij}} w_{type}(W)$$

$$time\_sequence(D_i, D) = \frac{timestamp(D_{maxtime}) - timestamp(D_i)}{timestamp(D_{maxtime}) - timestamp(D_{mintime})}$$

$$clusters\_selected(C_{ij}, S) = |C_{ij} \cap \bigcup_{v,w:P_{vw} \in S} C_{vw}|$$

$$documents\_selected(D_i, S) = \frac{1}{|D_i|} * \sum_{w} [P_{iw} \in S]$$

where
Sim_1 is the similarity metric for relevance ranking
Sim_2 is the anti-redundancy metric
D is a document collection
P is the passages from the documents in that collection (e.g., P_{ij} is passage j from document D_i)
Q is a query or user profile
$R = IR(D, P, Q, \theta)$, i.e., the ranked list of passages from documents retrieved by an IR system, given D, P, Q and a relevance threshold θ, below which it will not retrieve passages (θ can be degree of match or number of passages)
S is the subset of passages in R already selected
$R \setminus S$ is the set difference, i.e., the set of as yet unselected passages in R
C is the set of passage clusters for the set of documents
C_{vw} is the subset of clusters of C that contains passage P_{vw}
C_v is the subset of clusters that contain passages from document D_v
$|k|$ is the number of passages in the individual cluster k
$|C_{vw} \cap C_{ij}|$ is the number of clusters in the intersection of C_{vw} and C_{ij}
w_k are weights for the terms, which can be optimized
W is a word in the passage P_{ij}
type is a particular type of word, e.g., city name
$|D_i|$ is the length of document i.

Figure 1: Definition of multi-document summarization algorithm - MMR-MD

1. **WSJ910204-0176:** 1 CAPE TOWN, South Africa – President F.W. de Klerk's proposal to repeal the major pillars of apartheid drew a generally positive response from black leaders, but African National Congress leader Nelson Mandela called on the international community to continue economic sanctions against South Africa until the government takes further steps.
2. **AP880803-0082:** 25 Three Canadian anti-apartheid groups issued a statement urging the government to sever diplomatic and economic links with South Africa and aid the African National Congress, the banned group fighting the white-dominated government in South Africa.
3. **AP880803-0080:** 25 Three Canadian anti-apartheid groups issued a statement urging the government to sever diplomatic and economic links with South Africa and aid the African National Congress, the banned group fighting the white-dominated government in South Africa.
4. **AP880802-0165:** 23 South Africa says the ANC, the main black group fighting to overthrow South Africa's white government, has seven major military bases in Angola, and the Pretoria government wants those bases closed down.
5. **AP880212-0060:** 14 ANGOP quoted the Angolan statement as saying the main causes of confict in the region are South Africa's "illegal occupation" of Namibia, South African attacks against its black-ruled neighbors and its alleged creation of armed groups to carry out "terrorist activities" in those countries, and the denial of political rights to the black majority in South Africa.
6. **AP880823-0069:** 17 The ANC is the main guerrilla group fighting to overthrow the South African government and end apartheid, the system of racial segregation in which South Africa's black majority has no vote in national affairs.
7. **AP880803-0158:** 26 South Africa says the ANC, the main black group fighting to overthrow South Africa's white-led government, has seven major military bases in Angola, and it wants those bases closed down.
8. **AP880613-0126:** 15 The ANC is fighting to topple the South African government and its policy of apartheid, under which the nation's 26 million blacks have no voice in national affairs and the 5 million whites control the economy and dominate government.
9. **AP880212-0060:** 13 The African National Congress is the main rebel movement fighting South Africa's white-led government and SWAPO is a black guerrilla group fighting for independence for Namibia, which is administered by South Africa.
10. **WSJ870129-0051:** 1 Secretary of State George Shultz, in a meeting with Oliver Tambo, head of the African National Congress, voiced concerns about Soviet influence on the black South African group and the ANC's use of violence in the struggle against apartheid.

Figure 2: Sample multi-document summary with $\lambda = 1$, news-story-principle ordering (rank order)

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified Billheimer teaching, wherein creating a weighted document term-frequency vector for said document, to includes a means of creating, selecting a weighted sentence term-frequency vector for each sentence in said document by computing a score for each said weighted sentence term-frequency vector in accordance with relevance to said weighted document, and deleting said sentence from said document of Goldstein, and Goldstein's Sentence Extraction . One of ordinary skill in the art would have been motivated to perform such a modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122).)

Regarding **independent claim 9**, Billheimer teaches:

> **A system for creating a generic text summary of a document; said system comprising: a computer; a display for displaying said generic text summary; and summarizer program code, operable on said computer, for analyzing and summarizing said document; said summarizer program code comprising:**

(See, Billheimer at col. 8 line 25 through col. 9, line 5, also see Fig. 2, teaching computer system suitable for implementing the method of summarization of individual documents and groups of documents, and document cross-referencing using a term frequency matrix of the term frequencies for each of the documents.

In addition, Billheimer teaches:

> **a vector generator for creating a weighted document term-frequency vector for said document;**

Also, see, Billheimer at col. 4, line 35 through col. 6, line 40, discloses summarization of individual documents and groups of documents, and document cross-referencing using a term frequency matrix of the term frequencies for each of the documents. Using the broadest reasonable interpretation, the Examiner reads the claimed **a weighted document term-frequency vector** as equivalent to a term frequency matrix of the term frequencies for each of the documents as taught by Billheimer.

In addition, Billheimer does not explicitly teach, but Goldstein teaches:

> **creating a weighted sentence term-frequency vector for each sentence in said document; a scoring engine for computing a score for each said**

weighted sentence term-frequency vector in accordance with relevance to said weighted document term-frequency vector; and a selector for selecting a sentence for inclusion in said generic text summary in accordance with output results from said scoring engine

(See, Goldstein at pages 121-122, discloses the method of generating summaries by text extraction, wherein sentence is scored using a centroid query vector.

Also, see Goldstein at pages 121-122, discloses the method of generating summaries by text extraction, wherein each sentence is scored according to the following formula and then ordered in a summary according to rank order,

$$Score(S_i) = \lambda \sum_{s \in S} w_s * (Q_s \cdot S_i) + (1 - \lambda) * \sum_{l \in L} w_l * (L_l \cdot S_i)$$

where S is the set of statistical features, L is the set of linguistic features, Q is the query, and w is the weights for the features in that set. These weights can be tuned according to the type of data set used and the type of summary desired.

In addition, Billheimer and Goldstein do not explicitly teach, but Goldstein's Sentence Extraction teaches:

and a document editor for deleting said sentence from said document and for eliminating terms in said sentence from said document.

(See, Goldstein's Sentence Extraction at page 40 Title, discloses multi-document summarization by sentence extraction.

Also, see Goldstein's Sentence Extraction fig. 1 –3, and at pages 44 right-col bottom through page 45 left-col bottom, discloses multi-document summarization by sentence

extraction. For example, Figure 2 depict sentences from (#1- #10 with rank order), wherein sentences #2, #4, #6, and #9, which constitutes 70% of the sentences in the summary. Furthermore, sentence #3 is an exact duplicate of sentence #2, and sentence #7 is almost identical to sentence #4. Finally, the new summary retained only three of the sentences from the earlier summary. Using the broadest reasonable interpretation, the Examiner equates the claimed **deleting said sentence from said document** as equivalent to document summarization by sentence extraction as taught by Goldstein's Sentence Extraction.

Also, see Goldstein's Sentence Extraction section 5 System Design right col- middle, teaching segment the documents into passages (passages may be phrases, sentences, n-sentence chunks, or paragraphs, and index them using inverted indices (as used by the IR engine). Using the broadest reasonable interpretation, the Examiner equates the claimed **editor** as equivalent to the IR engine as taught by Goldstein's Sentence Extraction.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have combined Billheimer, Goldstein, and Goldstein's Sentence to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122), and provides document summarization by sentence extraction as taught by Goldstein's Sentence Extraction.

Regarding **independent claim 13**,

the rejection of claim 1 is fully incorporated.

In addition, Billheimer and Goldstein do not explicitly teach, but Goldstein's Sentence Extraction teaches:

recreating said weighted document term-frequency vector in accordance with said deleting and said eliminating.

(See, Goldstein's Sentence Extraction fig. 1 –3, and at pages 44 right-col bottom through page 45 left-col bottom, discloses multi-document summarization by sentence extraction. For example, Figure 2 depict sentences from (#1- #10 with rank order), wherein sentences #2, #4, #6, and #9, which constitutes 70% of the sentences in the summary. Furthermore, sentence #3 is an exact duplicate of sentence #2, and sentence #7 is almost identical to sentence #4. Finally, the new summary retained only three of the sentences from the earlier summary. Using the broadest reasonable interpretation, the Examiner equates the claimed as equivalent to the new summary retained only three of the sentences from the earlier summary as taught by Goldstein's Sentence Extraction.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified Billheimer teaching, wherein creating a weighted document term-frequency vector for said document, to includes a means of creating, selecting a weighted sentence term-frequency vector for each sentence in said document by computing a score for each said weighted sentence term-frequency vector in accordance with relevance to said weighted document, and deleting said sentence from said document of Goldstein, and Goldstein's Sentence Extraction . One of ordinary skill in the art would have been motivated to

perform such a modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122).)

Regarding **independent claim 21**,

the rejection of claim 1 is fully incorporated. In addition, Billheimer teaches:

A system for creating a generic text summary of a document; said system comprising: a computer; a display for displaying said generic text summary; and summarizer program code, operable on said computer, for analyzing and summarizing said document; said summarizer program code comprising:

(See, Billheimer at col. 8 line 25 through col. 9, line 5, also see Fig. 2, teaching computer system suitable for implementing the method of summarization of individual documents and groups of documents, and document cross-referencing using a term frequency matrix of the term frequencies for each of the documents.

In addition, Billheimer and Goldstein's Sentence Extraction do not expressly teach, but Goldstein teaches:

a vector generator for creating a weighted document term-frequency vector for said document;

(See, Goldstein at pages 121-122, discloses the method of generating summaries by text extraction, wherein scoring sentences with respect to both statistical and linguistic features such that a centroid query vector is calculated using high frequency document words and the title of

the document wherein each sentence is scored accordingly (e.g. using Score formula on page 122) and then ordered in a summary according to rank order, wherein each sentence is scored according to the following formula and then ordered in a summary according to rank order,

$$Score(S_i) = \lambda \sum_{s \in S} w_s * (Q_s \cdot S_i) + (1 - \lambda) * \sum_{l \in L} w_l * (L_l \cdot S_i)$$

where S is the set of statistical features, L is the set of linguistic features, Q is the query, and w is the weights for the features in that set. These weights can be tuned according to the type of data set used and the type of summary desired) Examiner read the above in the broadest reasonable interpretation to the claim limitation, wherein a vector generator would have been an obvious variant of scoring sentences with respect to both statistical and linguistic features such that a centroid query vector is calculated using high frequency document words and the title of the document wherein each sentence is scored accordingly (e.g. using Score formula on page 122) and then ordered in a summary according to rank order, to a person of ordinary skill in the art at the time the invention was made.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified Billheimer and Goldstein's Sentence Extraction teaching, to include a means of creating a weighted document term-frequency vector for said document from a vector generator of Goldstein's teaching. One of ordinary skill in the art would have been motivated to perform such a modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122).

Regarding **independent claim 26**, the rejection of claim 9 is fully incorporated. In addition,

Billheimer teaches:

an SVD performer for performing singular value decomposition on said terms-by-sentences matrix to generate a singular value matrix and a right singular vector matrix;

(See, Billheimer at col. 3 lines 55-60, teaching latent semantic indexing (LSI), and singular value decomposition (SVD).

Also, see Goldstein at page 122 section 2 Generating Summaries by Text Extraction para 3, teaching summaries by scoring sentences. Using the broadest reasonable interpretation the Examiner equates the claimed **SVD performer for performing singular value decomposition on said terms-by-sentences** as SVD is used to identify the term frequency matrix in documents as taught by Billheimer and summaries by scoring sentences as taught by Goldstein.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified Billheimer teaching of SVD, and Goldstein's Sentence Extraction teaching, to include a means terms-by-sentences matrix to generate a singular value matrix as taught by of Goldstein. One of ordinary skill in the art would have been motivated to perform such a modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122).

Regarding **independent claim 29**,

the rejection of claims 13 and 26 are fully incorporated.

Regarding **claim 2**, the rejection of claims 9 and 13 are fully incorporated.

In addition, Billheimer teaches:

selectively repeating said computing, said selecting,

(See, Billheimer at col. 8 lines 60-65, teaching a display and user interactive interface is provided.

Also, see Billheimer at col. 9 lines 55-65, teaching the logic decision function (capable of repeating the operation as long as needed).)

Regarding **claim 3**, Billheimer and Goldstein's Sentence Extraction do not explicitly teach,

But Goldstein teaches:

the method of claim 2 wherein said selectively repeating is terminated when a predetermined number of sentences has been selected.

(See, Goldstein at page 122, teaching a fixed–length generic summary is produced. Using the broadest reasonable interpretation, the examiner equates the claimed **a predetermined number of sentences** as equivalent to a fixed–length generic summary as taught by Goldstein.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have combined Billheimer, and Goldstein's Sentence, to include a means of selectively repeating is terminated when a predetermined number of sentences has been selected. One of ordinary skill in the art would have been motivated to perform such a

modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122) and provides document summarization by sentence extraction as taught by Goldstein's Sentence Extraction.)

Regarding **claim 4**, Billheimer and Goldstein's Sentence Extraction do not explicitly teach,

But Goldstein teaches:

calculating an inner product of said weighted sentence term-frequency vector and said weighted document term-frequency vector

(See, Goldstein at pages 121-122, discloses the method of generating summaries by text extraction, wherein each sentence is scored according to the following formula and then ordered in a summary according to rank order.

$$Score(S_i) = \lambda \sum_{s \in S} w_s * (Q_s \cdot S_i) + (1 - \lambda) * \sum_{l \in L} w_l * (L_l \cdot S_i)$$

where S is the set of statistical features, L is the set of linguistic features, Q is the query, and w is the weights for the features in that set. These weights can be tuned according to the type of data set used and the type of summary desired, wherein scoring sentences with respect to both statistical and linguistic features such that a centroid query vector is calculated using high frequency document words and the title of the document wherein each sentence is scored accordingly (e.g. using Score formula on page 122). The evaluators also marked each document as relevant or not relevant to the topic and selected the three most relevant sentences for each article from the sentences that they had marked relevant (yielding a most relevant sentence data

set of 1-9 sentences per document). This set has an average of 5.6 sentences per document and 58.2% of the relevant sentence summaries contain the first sentence. An ideal query-relevant text summary must contain the relevant information to fulfill a user's information seeking goals, as well as eliminates irrelevant and redundant information) Examiner read the above in the broadest reasonable interpretation to the claim limitation, wherein the inner product of a weighted sentence term-frequency vector and relevance to said weighted document would have been an obvious variant of calculation of a centroid query vector such as

$$Score(S_i) = \lambda \sum_{s \in S} w_s * (Q_s \cdot S_i) + (1 - \lambda) * \sum_{l \in L} w_l * (L_l \cdot S_i)$$

since inner product is well known mathematical method of an operation on two vectors, which produces a scalar and then ordered in a summary according to rank order, to a person of ordinary skill in the art at the time the invention was made.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have combined Billheimer, and Goldstein's Sentence, to include a means of calculating an inner product of said weighted sentence term-frequency vector as taught by Goldstein. One of ordinary skill in the art would have been motivated to perform such a modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122) and provides document summarization by sentence extraction as taught by Goldstein's Sentence Extraction.)

Regarding **claim 5**, Billheimer and Goldstein's Sentence Extraction do not explicitly teach, but Goldstein teaches:

> **wherein said creating a weighted sentence term-frequency vector comprises implementing a local weighting function and implementing a global weighting function.**

(See, Goldstein at pages 121-122, discloses the method of generating summaries by text extraction, wherein scoring sentences with respect to both statistical and linguistic features such that a centroid query vector is calculated using high frequency document words and the title of the document wherein each sentence is scored accordingly (e.g. using Score formula on page 122) and then ordered in a summary according to rank order. Using the broadest reasonable interpretation, the Examiner equates the claimed a local weighting function and implementing a global weighting function as equivalent to scoring sentences with respect to both statistical and linguistic features such that a centroid query vector as taught by Goldstein.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have combined Billheimer, and Goldstein's Sentence, to include a means of creating a weighted sentence term-frequency vector comprises implementing a local weighting function and implementing a global weighting function as taught by Goldstein One of ordinary skill in the art would have been motivated to perform such a modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122) and provides document summarization by sentence extraction as taught by Goldstein's Sentence Extraction.)

Regarding **claim 6**, the rejection of claim 4 is fully incorporated.

In addition, Billheimer and Goldstein's Sentence Extraction do not explicitly teach, but Goldstein teaches:

normalizing each said weighted sentence term-frequency vector.

(See, Goldstein at pages 121-125, discloses the method of generating summaries by text extraction, wherein analysis of news-article summaries generated by sentence selection. Sentences are ranked for potential inclusion in the summary using a weighted combination of statistical and linguistic features. The statistical features were adapted from standard IR methods. The potential linguistic ones were derived from an analysis of news-wire summaries. To evaluate these features we use a normalized version of precision-recall curves, with a baseline of random sentence selection (see the normalized version as formulas (1) and (2) on page 125 for details).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have combined Billheimer, and Goldstein's Sentence, to include a means of normalizing each said weighted sentence term-frequency vector as taught by Goldstein One of ordinary skill in the art would have been motivated to perform such a modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122) and provides document summarization by sentence extraction as taught by Goldstein's Sentence Extraction.)

Regarding **claim 7**, Billheimer teaches:

creating a weighted document term-frequency vector comprises implementing a local weighting function and implementing a global weighting function

(Billheimer at col. 4, line 35 through col. 6, line 40, discloses an information retrieval method, wherein term and document visualization, term and document clustering, term and document classification, summarization of individual documents and groups of documents, and document cross-referencing. This is accomplished by representing the text of a document collection using subspace transformations. This subspace transformation representation is performed by: constructing a term frequency matrix of the term frequencies for each of the documents, transforming the term frequencies for statistical purposes, and projecting the documents or the terms into a lower dimensional subspace. Examiner read the above in the broadest reasonable interpretation to the claim limitation, wherein implementing **a local weighting function and implementing a global weighting function** would have been an obvious variant of constructing a term frequency matrix of the term frequencies for each of the documents, transforming the term frequencies for statistical purposes, and projecting the documents or the terms into a lower dimensional subspace, to a person of ordinary skill in the art at the time the invention was made.

Regarding **claim 8**, Billheimer and Goldstein's Sentence Extraction do not explicitly teach, but Goldstein teaches:

creating a weighted document term-frequency vector comprises normalizing each said weighted document term-frequency vector.

(See, Goldstein at pages 121-125, discloses the method of generating summaries by text extraction, wherein analysis of news-article summaries generated by sentence selection. Sentences are ranked for potential inclusion in the summary using a weighted combination of statistical and linguistic features. The statistical features were adapted from standard IR methods. The potential linguistic ones were derived from an analysis of news-wire summaries. To evaluate these features we use a normalized version of precision-recall curves, with a baseline of random sentence selection (see the normalized version as formulas (1) and (2) on page 125 for details).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have combined Billheimer, and Goldstein's Sentence, to include a means of creating a weighted document term-frequency vector comprises normalizing each said weighted document term-frequency vector as taught by Goldstein One of ordinary skill in the art would have been motivated to perform such a modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122) and provides document summarization by sentence extraction as taught by Goldstein's Sentence Extraction.)

Regarding **claim 10**, the rejection of claim 9 is fully incorporated.

In addition, Billheimer teaches:

the system of claim 9 wherein said vector generator recreates said weighted document term-frequency vector in accordance with output results.

(Billheimer at col. 4, line 35 through col. 6, line 40, discloses subspace transformation representation is performed by: constructing a term frequency matrix of the term frequencies for each of the documents, transforming the term frequencies for statistical purposes, and projecting the documents or the terms into a lower dimensional subspace. Using the broadest reasonable interpretation, the Examiner equates the claimed **weighted document term-frequency vector in accordance with output results** as equivalent to term frequencies for statistical purposes, and projecting the documents or the terms into a lower dimensional subspace as taught by Billheimer.

Regarding **claim 11**, the rejection of claims 2 and 9 are fully incorporated.

In addition, Billheimer teaches:

the system of claim 10 wherein said summarizer further comprises a loop routine for generating iterative sequential operations.

(Billheimer at col. 4, line 35 through col. 6, line 40, discloses subspace transformation representation is performed by: constructing a term frequency matrix of the term frequencies for each of the documents, transforming the term frequencies for statistical purposes, and projecting the documents or the terms into a lower dimensional subspace. Using the broadest reasonable

interpretation, the Examiner equates the claimed **loop routine** as equivalent projecting the documents or the terms into a lower dimensional subspace as taught by Billheimer.

Regarding **claim 12**, the rejection of claim 3 is fully incorporated.

Regarding **claims 14-20**, the rejection of claims 2-8 are fully incorporated respectively.

Regarding **claims 22-23**, the rejection of claims 2-3 is fully incorporated respectively.

Regarding **claim 24**, Goldstein's Sentence Extraction does not explicitly teach,

but Billheimer and Goldstein teach:

The method of claim 21 wherein said selecting further comprises identifying a sentence having a desired index value with said right singular vector.

(See, Billheimer at col. 3 lines 55-60, teaching latent semantic indexing (LSI), and singular value decomposition (SVD).

Also, see Goldstein at page 122 section 2 Generating Summaries by Text Extraction para 3, teaching summaries by scoring sentences. Using the broadest reasonable interpretation the Examiner equates the claimed **a sentence having a desired index value with said right singular vector** as equivalent to SVD is used to identify the term frequency matrix in documents as taught by Billheimer and summaries by scoring sentences as taught by Goldstein.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified Billheimer teaching of SVD, and Goldstein's Sentence Extraction teaching, to include a means terms-by-sentences matrix to generate a singular value matrix as taught by of Goldstein. One of ordinary skill in the art would have been motivated to perform such a modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122).

Regarding **claim 25**, the rejection of claim 5 is fully incorporated.

Regarding **claims 27-28**, the rejection of claims 11-12 are fully incorporated respectively.

Regarding **claims 30-32**, the rejection of claims 23-25 are fully incorporated respectively.

6. It is noted that any citations to specific, pages, columns, lines, or figures in the prior art references and any interpretation of the references should not be considered to be limiting in any way. A reference is relevant for all it contains and may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art. See, MPEP 2123.

Response to Arguments

7. Applicant's arguments, in the Remarks filed 12-29-2006 with respect to claims 1-32 have been considered but are moot in view of the new ground(s) of rejection.

In addition, to address Applicant argues against Billheimer and Goldstein, which are accordingly addressed below.

Regarding claims 1-20:

First, Applicant argues that Billheimer and Goldstein fail to teach **" relevance score as recited in claim 1. "** (Remarks, page 11).

The Examiner disagrees.

As discuss in the rejection above, Specifically Goldstein discloses the method of generating summaries by text extraction, wherein sentence is scored using a centroid query vector. As illustrates in equation bellows, how the Score (Si) is obtaining form the documents:

$$Score(S_i) = \lambda \sum_{s \in S} w_s * (Q_s \cdot S_i) + (1 - \lambda) * \sum_{l \in L} w_l * (L_l \cdot S_i)$$

where S is the set of statistical features, L is the set of linguistic features, Q is the query, and w is the weights for the features in that set. These weights can be tuned according to the type of data set used and the type of summary desired (see Goldstein page 121-124 section 1-4).

In addition, the Examiner introduce Goldstein's Sentence Extraction, whose discloses a method of document summarization by sentence extraction using MMR-MD algorithm to result the new summary retained only three of the sentences rather original 10 sentences from the earlier summary (Goldstein's Sentence Extraction fig. 1-3).

$$MMR\text{-}MD \stackrel{def}{=} Arg \max_{P_{ij} \in R \setminus S} \left[\lambda (Sim_1(P_{ij}, Q, C_{ij}, D_i, D)) - (1-\lambda) \max_{P_{nm} \in S} Sim_2(P_{ij}, P_{nm}, C, S, D_i)) \right]$$

$$Sim_1(P_{ij}, Q, C_{ij}, D_i, D) = w_1 * (P_{ij} \cdot Q) + w_2 * coverage(P_{ij}, C_{ij}) + w_3 * content(P_{ij}) + w_4 * time\_sequence(D_i, D)$$

$$Sim_2(P_{ij}, P_{nm}, C, S, D_i) = w_a * (P_{ij} \cdot P_{nm}) + w_b * clusters\_selected(C_{ij}, S) + w_c * documents\_selected(D_i, S)$$

$$coverage(P_{ij}, C) = \sum_{k \in C_{ij}} w_k * |k|$$

$$content(P_{ij}) = \sum_{W \in P_{ij}} w_{type}(W)$$

$$time\_sequence(D_i, D) = \frac{timestamp(D_{maxtime}) - timestamp(D_i)}{timestamp(D_{maxtime}) - timestamp(D_{mintime})}$$

$$clusters\_selected(C_{ij}, S) = |C_{ij} \cap \bigcup_{v,w:P_{vw} \in S} C_{vw}|$$

$$documents\_selected(D_i, S) = \frac{1}{|D_i|} * \sum_{w} [P_{iw} \in S]$$

where
Sim_1 is the similarity metric for relevance ranking
Sim_2 is the anti-redundancy metric
D is a document collection
P is the passages from the documents in that collection (e.g., P_{ij} is passage j from document D_i)
Q is a query or user profile
$R = IR(D, P, Q, \theta)$, i.e., the ranked list of passages from documents retrieved by an IR system, given D, P, Q and a relevance threshold θ, below which it will not retrieve passages (θ can be degree of match or number of passages)
S is the subset of passages in R already selected
$R \setminus S$ is the set difference, i.e., the set of as yet unselected passages in R
C is the set of passage clusters for the set of documents
C_{vw} is the subset of clusters of C that contains passage P_{vw}
C_v is the subset of clusters that contain passages from document D_v
$|k|$ is the number of passages in the individual cluster k
$|C_{vw} \cap C_{ij}|$ is the number of clusters in the intersection of C_{vw} and C_{ij}
w_i are weights for the terms, which can be optimized
W is a word in the passage P_{ij}
type is a particular type of word, e.g., city name
$|D_i|$ is the length of document i.

Figure 1: Definition of multi-document summarization algorithm - MMR-MD

1. **WSJ910204-0176:** 1 CAPE TOWN, South Africa – President F.W. de Klerk's proposal to repeal the major pillars of apartheid drew a generally positive response from black leaders, but African National Congress leader Nelson Mandela called on the international community to continue economic sanctions against South Africa until the government takes further steps.
2. **AP880803-0082:** 25 Three Canadian anti-apartheid groups issued a statement urging the government to sever diplomatic and economic links with South Africa and aid the African National Congress, the banned group fighting the white-dominated government in South Africa.
3. **AP880803-0080:** 25 Three Canadian anti-apartheid groups issued a statement urging the government to sever diplomatic and economic links with South Africa and aid the African National Congress, the banned group fighting the white-dominated government in South Africa.
4. **AP880802-0165:** 23 South Africa says the ANC, the main black group fighting to overthrow South Africa's white government, has seven major military bases in Angola, and the Pretoria government wants those bases closed down.
5. **AP880212-0060:** 14 ANGOP quoted the Angolan statement as saying the main causes of confict in the region are South Africa's "illegal occupation" of Namibia, South African attacks against its black-ruled neighbors and its alleged creation of armed groups to carry out "terrorist activities" in those countries, and the denial of political rights to the black majority in South Africa.
6. **AP880823-0069:** 17 The ANC is the main guerrilla group fighting to overthrow the South African government and end apartheid, the system of racial segregation in which South Africa's black majority has no vote in national affairs.
7. **AP880803-0158:** 26 South Africa says the ANC, the main black group fighting to overthrow South Africa's white-led government, has seven major military bases in Angola, and it wants those bases closed down.
8. **AP880613-0126:** 15 The ANC is fighting to topple the South African government and its policy of apartheid, under which the nation's 26 million blacks have no voice in national affairs and the 5 million whites control the economy and dominate government.
9. **AP880212-0060:** 13 The African National Congress is the main rebel movement fighting South Africa's white-led government and SWAPO is a black guerrilla group fighting for independence for Namibia, which is administered by South Africa.
10. **WSJ870129-0051:** 1 Secretary of State George Shultz, in a meeting with Oliver Tambo, head of the African National Congress, voiced concerns about Soviet influence on the black South African group and the ANC's use of violence in the struggle against apartheid.

Figure 2: Sample multi-document summary with $\lambda = 1$, news-story-principle ordering (rank order)

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified Billheimer teaching, wherein creating a weighted document term-frequency vector for said document, to includes a means of creating, selecting a weighted sentence term-frequency vector for each sentence in said document by computing a score for each said weighted sentence term-frequency vector in accordance with relevance to said weighted document, and deleting said sentence from said document of Goldstein, and Goldstein's Sentence Extraction . One of ordinary skill in the art would have been motivated to perform such a modification to produce a query-relevant summary base upon the a weighted sentence term-frequency vector and accordance with relevance to said weighted document (Goldstein at pages 121-122).)

Second, Applicant argues " **(3) Then, after the sentence is included into the summary, the sentence as well as all the words contained in this sentence are REMOVED from the entire document. Item number (3) is a unique approach, which is not disclosed or suggested in the cited references. Therefore, for at least these reasons, the Examiner is requested to withdraw the rejection of claims 1-20.** " (Remarks, page 12).

The Examiner disagrees.

As discuss in the rejection above, Specifically Billheimer discloses a method and sytem for text mining of doucments using the known LSI or SVD or SDD to measure the important of each featue of a document (see Billheimer col. 3, lines 55-60).

In addtion, Goldstein discloses the method of generating summaries by text extraction, wherein sentence is scored using a centroid query vector. As illustrates in equation bellows, how the Score (Is) is obtaining form the documents:

$$Score(S_i) = \lambda \sum_{s \in S} w_s * (Q_s \cdot S_i) + (1 - \lambda) * \sum_{l \in L} w_l * (L_l \cdot S_i)$$

Where S is the set of statistical features, L is the set of linguistic features, Q is the query, and w is the weights for the features in that set. These weights can be tuned according to the type of data set used and the type of summary desired (see Goldstein page 121-124 section 1-4).

In addition, the Examiner introduce Goldstein's Sentence Extraction, whose discloses a method of document summarization by sentence extraction using MMR-MD algorithm to result the new summary retained only three of the sentences rather than original 10 sentences from the earlier summary (Goldstein's Sentence Extraction fig. 1-3). Using the broadest reasonable

interpretation, the Examiner equates the claimed **deleting said sentence from said document** as equivalent to document summarization by sentence extraction as taught by Goldstein's Sentence Extraction.

Regarding claims 21-32:

Applicant argues " **The SVD-based indexing and retrieval method uses the SVD mainly for the purpose of dimension reduction and noise reduction, which leads to a better similarity measure between documents and queries. In contrast, the claimed invention uses the SVD mainly for capturing the salient topics of the input document and for identifying the best sentences to represent the salient topics.** " (Remarks, page 13).

The Examiner disagrees.

As discuss in the rejection above, Specifically Billheimer discloses a method and sytem text mining of doucments using the known LSI or SVD or SDD to measure the important of each featue of a document (see Billheimer col. 3, lines 55-60). In addition, for example Billheimer illustrates in FIGS. 15-18 a pictorial representation of a term frequency matrix. Each column represents a document in a document collection. Each row represents a term found in one or more of the documents. For each row/column entry, the raw number of occurrences of the term for the given row for the document is displayed. Alternatively, the matrix can be formed with columns representing the terms and rows representing the documents, with subsequent operations modified accordingly. To the right of the table is the query vector. At the bottom of each column is the score for the query vector. FIG. 15 illustrates the results of a query for the

term "Apache." For this query, only Document A 302, Document C 304, and Document E 306 have non-zero scores. Therefore, only these three documents are returned, although Document B 303 should also be returned because it contains "AH-64", which is a synonym for "Apache."

In addition, the Examiner introduce Goldstein's Sentence Extraction, whose discloses a method of document summarization by sentence extraction using single document decomposition and text span deletion algorithm to result the new summary retained only three of the sentences rather than original 10 sentences from the earlier summary (Goldstein's Sentence Extraction fig. 1-3).

$$MMR\text{-}MD \stackrel{def}{=} Arg \max_{P_{ij} \in R \setminus S} \left[\lambda(Sim_1(P_{ij}, Q, C_{ij}, D_i, D)) - (1-\lambda) \max_{P_{nm} \in S} Sim_2(P_{ij}, P_{nm}, C, S, D_i)) \right]$$

$$Sim_1(P_{ij}, Q, C_{ij}, D_i, D) = w_1 * (P_{ij} \cdot Q) + w_2 * coverage(P_{ij}, C_{ij}) + w_3 * content(P_{ij}) + w_4 * time\_sequence(D_i, D)$$

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S is the subset of passages in R already selected
$R \setminus S$ is the set difference, i.e., the set of as yet unselected passages in R
C is the set of passage clusters for the set of documents
C_{vw} is the subset of clusters of C that contains passage P_{vw}
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$|k|$ is the number of passages in the individual cluster k
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For at least all the above evidence, therefore the Examiner respectfully maintains the rejection of claims 1-32, at this time.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quoc A. Tran whose telephone number is 571-272-8664. The examiner can normally be reached on 9AM - 5PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Herndon R. Heather can be reached on 571-272-4136. The fax phone number for the organization where this application or proceeding is assigned is (571)-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Quoc A. Tran
Patent Examiner
March. 17, 2007

H Herndon

Heather R. Herndon
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